

Claims

1. A process for welding one or more metal workpieces to be joined together by producing at least 5 one welded joint between the edges to be welded of the said metal workpiece or workpieces, the said welded joint being obtained by using at least one laser beam and at least one electric arc, in which process, during welding of the joint, at least one part of the welding 10 zone comprising at least one part of said welded joint is shielded during the operation with at least one shielding atmosphere formed by a gas mixture consisting of:

15 - argon and/or helium with a content greater than or equal to 70% by volume; and
- at least one additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0 to 30% by volume.

20 2. The welding process as claimed in claim 1, wherein the content of at least one additional compound chosen from H₂, O₂, CO₂ and N₂ is non zero and less than or equal to 20% by volume, preferably non zero and less than or equal to 15% by volume.

25 3. The welding process as claimed in either of claims 1 and 2, wherein the shielding atmosphere is formed by a gas mixture consisting of argon with a content greater than or equal to 70% by volume and of at least one additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0.1 to 30% by volume, preferably a gas mixture consisting of argon with a 30 content greater than or equal to 70% by volume and of 0.1 to 30% by volume of an additional compound chosen from H₂, O₂, CO₂ and N₂.

35 4. The welding process as claimed in one of claims 1 to 3, wherein the shielding atmosphere is formed by a gas mixture consisting of argon with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of several additional compounds

chosen from H₂, O₂, CO₂ and N₂, preferably a mixture of argon, O₂ and CO₂.

5. The welding process as claimed in either of claims 1 and 2, wherein the shielding atmosphere is formed by a gas mixture consisting of helium with a content greater than or equal to 70% by volume and of at least one additional compound chosen from H₂, O₂, CO₂ and N₂ with a content of 0.1 to 30% by volume, preferably a gas mixture consisting of helium with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of an additional compound chosen from H₂, O₂, CO₂ and N₂.

10. The welding process as claimed in one of claims 1, 2 or 5, wherein the shielding atmosphere is formed by a gas mixture consisting of helium with a content greater than or equal to 70% by volume and of 0.1 to 30% by volume of several additional compounds chosen from H₂, O₂, CO₂ and N₂, preferably a mixture of helium, O₂ and CO₂ and furthermore possibly containing H₂.

15. The welding process as claimed in one of claims 1 to 6, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by volume of helium and argon and of 0.1 to 30% by volume of at least one additional compound chosen from H₂, O₂, CO₂ and N₂, preferably a gas mixture consisting of 0.1% to 69.9% by volume of helium, of 0.1% to 69.9% by volume of argon and of 0.1 to 30% by volume of at least one additional compound chosen from H₂, O₂, CO₂ and N₂, the sum of the argon and helium contents being at least 70% of the total volume of the mixture.

20. The welding process as claimed in one of claims 1 to 7, wherein the workpiece or workpieces to be welded are made of a metal or a metal alloy chosen from coated or uncoated steels, particularly assembly steels, HLES steels, carbon steels, steels having a layer of zinc alloy on the surface, stainless steels,

aluminum or aluminum alloys and high yield point steels.

9. The welding process as claimed in one of claims 1 to 8, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by volume of helium and/or argon and of 0.1 to 30% by volume of at least one additional compound chosen from O₂ and CO₂ and wherein the workpiece or workpieces to be welded are made of steel, especially carbon steel.

10 10. The welding process as claimed in one of claims 1 to 8, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by volume of helium, of 0.1 to 30% by volume of hydrogen and of 0 to 29.9% by volume of at least one additional compound chosen from O₂ and CO₂, and wherein the workpiece or workpieces to be welded are made of stainless steel.

11. The welding process as claimed in one of claims 1 to 8, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 90% by volume of helium or of argon and of 0.1 to 10% by volume of at least one additional compound chosen from O₂ and CO₂, and wherein the workpiece or workpieces to be welded are made of aluminum, preferably of at least 96% by volume of helium or argon and of 0.1 to 4% by volume of at least one additional compound chosen from O₂ and CO₂.

12. The welding process as claimed in one of claims 1 to 8, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 85% by volume of helium or of argon and of 0.1 to 15% by volume of H₂, and wherein the workpiece or workpieces to be welded are made of stainless steel, preferably of at least 90% by volume of helium or argon and of 0.1 to 10% by volume of H₂.

13. The welding process as claimed in one of claims 1 to 8, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 70% by

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volume of helium and/or argon and of 0.1 to 30% by volume of N₂, and wherein the workpiece or workpieces to be welded are made of steel, preferably of at least 80% by volume of helium and/or argon and the balance being N₂.

14. The welding process as claimed in one of claims 1 to 8, wherein the shielding atmosphere is formed by a gas mixture consisting of at least 85% by volume of helium and/or argon and of 0.1 to 15% by volume of H₂ and CO₂, and wherein the workpiece or workpieces to be welded are made of stainless steel.

15. The welding process as claimed in one of claims 1 to 14, wherein the laser beam is emitted by an Nd:YAG or CO₂ laser and/or wherein the electric arc is a plasma arc.

16. The welding process as claimed in one of claims 1 to 15, wherein the electric arc is delivered by a plasma-arc torch and preferably the laser beam and said arc are delivered by a single welding head.

20 17. The welding process as claimed in one of claims 1 to 16, wherein the electrode is consumable or not consumable.

25 18. Use of a welding process as claimed in one of claims 1 to 17 for welding at least one tailored blank intended to constitute at least one part of a vehicle body element.

30 19. Use of a welding process as claimed in one of claims 1 to 17 for joining together, by welding, metal workpieces having different thicknesses, particularly tailored blanks.

35 20. Use of a welding process as claimed in one of claims 1 to 17 for joining together, by welding, metal workpieces having the same or different thicknesses and having different metallurgical compositions or metallurgical grades, particularly tailored blanks.

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21. Use of a welding process as claimed in one of claims 1 to 17 for joining together, by welding, the two longitudinal edges of a pre-tube.

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